REMARKS/ARGUMENTS

Introduction:

Claims 2, 3, 6-18, 21, 44, 46, 48, and 55-58 were amended, and claim 63 was added. Claims 2, 3, 6-18, 21, 44, 46, 48, 55-58, and 63 are now pending. (Claims 1, 4, 5, 19, 20, 22-43, 45, 47, 49-54, and 59-62 are now or were previously canceled.) Applicants respectfully request reconsideration and reexamination of the application.

Applicants note that the amendments to independent claim 2 are supported at least by Figures 1 and 8C-8F and accompanying text. The amendments to independent claim 12 are supported at least by Figures 13-14M and accompanying text, and the amendments to independent claim 18 are supported at least by Figures 9-10G and accompanying text. Moreover, at least paragraphs 6 and 117 support directing the claims to a "computer comprising computer hardware."

Applicants also note that at least the amendments to claims 15 and 16 are for clarification and not for patentability.

Objection to the Specification:

Paragraph 118 of the specification was objected to. Applicants amended paragraph 118 in an amendment dated October 23, 2003 to include the serial number of the referenced application. Applicants now further amend paragraph 118 to include the patent number of the application, which has issued as a patent.

Claim Objections:

Claims 2-10 were objected to. Applicants have amended those claims to address the Examiner's objections, which Applicants believe have been overcome. Applicants note that these amendments were made to address the objections but not for reasons relating to patentability.

Double Patenting:

In response to the double patenting rejection, Applicants will file a terminal disclaimer after all other issues in the application are resolved. Applicants also assert that claim 18 is not a substantial duplicate of claim 1 of the parent application.

Rejections under 35 USC 112:

Claims 13 and 14 were rejected as being unclear. Applicants have amended those claims to clarify those claims (but not for reasons relating to patentability) and believe that the Examiner's concerns have been addressed.

Rejections under 35 U.S.C. § 101:

Claims 2-62 were rejected under 35 U.S.C. § 101 as being non-statutory subject matter. Claims 22, 32, and 39 have been canceled, mooting the rejection of those claims. Otherwise, Applicants respectfully traverse this rejection.

Independent claims 2, 12, and 18 and the claims that depend from those independent claims appear to have been rejected under 35 USC 101 for two reasons. First, those claims allegedly are directed to an abstract idea, natural phenomenon, or law of nature. The PTO alleges that the claims are not restricted to any field of application. Second, the PTO alleges that those claims do not require any hardware but are directed to software per se.

Turning to the first reason, Applicants respectfully assert that independent claims 2, 12, and 18 are clearly not directed to an abstract idea, a natural phenomenon, or a law of nature. Computer-related inventions are examined for patentability under 35 U.S.C. § 101 according to MPEP § 2106. "If the record as a whole suggests that it is more likely than not that the claimed invention would be considered a practical application of an abstract idea, natural phenomenon, or law of nature, then USPTO personnel should not reject the claim." MPEP §2106(IV)(D). When the record as a whole is considered, the present application provides substantial examples showing that the claimed invention has a practical application. For example, claim 2 recites "means for receiving information representing a proposed physical layout of a routing space of an electronics system including locations of obstacles within said proposed physical layout," and claim 2 further recites "means for selecting a path through said adjusted array of nodes resulting in creation of a trace that passes between said pair of obstacles in said proposed physical layout." Claim 2 is thus directed to utilizing a computer to create traces in a routing space of an electronics system, which is a useful, practical application. Independent claims 12 and 18 are similarly directed to utilizing a computer to create traces in a routing space of an electronics system and are likewise therefore directed to a useful, practical application. Moreover,

independent claims 2, 12, and 18 are clearly directed not to every conceivable use of a routing algorithm but, as discussed above, to utilizing a computer to create traces in a routing space of an electronics system. For at least this reason, independent claims 2, 12, and 18 and the claims that depend from those claims are clearly directed not to an abstract idea, natural phenomenon, or law of nature but to a practical application that is useful in the field of routing traces in an electronics system.

The MPEP states that a claim is directed to a practical application if the claim produces a useful, concrete, and tangible result. (MPEP 2106, pg. 2100-11.) Here, all of the claims select or create a path that results in creation of a trace within a proposed physical layout of a routing space of an electronics system. Clearly, the creation or selection of a path that results in creation of a trace within a proposed physical layout of a routing space of an electronics system is useful as such can be used to make traces in such an electronics system. A result is tangible if it involves a practical application that produces a real-world result. (MPEP 2106, pg. 2100-12.) As discussed above, the claims select or create a path that results in creation of a trace within a proposed physical layout of a routing space of an electronic system. Information relating to such a path and trace can be used in making the electronics system. The path and resulting trace are therefore practical and represent a real-world result. A result is concrete if it is repeatable (MPEP 2106, pg. 2100-12), and the selection or creation of a path that results in a trace, as recited in the claims, is clearly repeatable. The pending claims thus produce a useful, concrete, tangible result and are, at least for this reason, directed to a practical application—not an abstract idea, natural phenomenon, or law of nature.

Turning now to the second reason, claims 2, 12, and 18 recite a "computer comprising computer hardware." Moreover, the specification states that the embodiments described in the specification "may be implemented in software operating on a general or special purpose computer" or "in specially designed hardware or a combination of software and special purpose hardware." Thus, as claimed, claims 2, 12, and 18 utilize computer hardware, which is supported by the specification. Clearly, claims 2, 12, and 18 are not directed to software per se. At least for this additional reason, claims 2, 12, and 18 and the claims that depend from those claims are directed to statutory subject matter.

For at least the reasons discussed above, Applicants respectfully assert that all of the claims are directed to statutory subject matter, and Applicants accordingly request withdrawal of the rejections under 35 U.S.C. 101.

Applicants note that similar issues regarding compliance with 35 U.S.C. 101 were raised during prosecution of a related application with serial no. 11/070,075 (which is a child of the application referred to in paragraph 118 of the specification of the instant application). Those issues were resolved generally for reasons similar to those discussed herein, and application serial no. 11/070,075 has now been allowed.

Rejections under 35 U.S.C. 102:

Claims 2-62 were rejected under 35 U.S.C. 102(e) as anticipated by Vaughn (U.S. Publication No. 2001/0038612). Applicants respectfully traverse the rejection.

Turning first to independent claim 2, Applicants note that claim 2 recites that the "means for adjusting includ[es] locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles, each of said nodes positioned between said pair of said obstacles representing a possible location of one of said traces that can pass between said obstacles." In rejecting former claims 3-7 (which recited features relating to nodes between a pair of obstacles), the PTO relied on paragraphs 109, 112, 157, and 182 of Vaughn. The features of Vaughn described in those paragraphs, however, do not meet the above quoted recitation in claim 2. Specifically, paragraph 109 refers to an action performed by Vaughn's analysis engine (110 in Figure 3A), which performs pre-routing actions. Paragraph 109 refers to an action in which Vaughn's analysis engine, prior to performing any actual routing, moves some paths, terminals, vias, and other routing data objects from high density areas to lower density areas in an attempt to even the distribution of such objects in the system. (Vaughn paragraphs 107, 108, and 109.) This is depicted visually in Figures 8A and 8B. The foregoing actions taken by Vaughn's analysis engine do not teach, suggest, or otherwise render obvious at least the following recitation in claim 2: "locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles."

Vaughn's paragraph 112 merely describes another action taken by the analysis engine of breaking segments (e.g., segments C1 and C2 in Figure 6) into horizontal and vertical

components. Again, there is no teaching or suggestion of "locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles."

Vaughn's paragraph 157 merely recites an action taken by Vaughn's routing zone controller (114 in Figure 3A) of dividing the routing area into zones prior to performing the actual routing. Because each zone represents less than the full routing area to be processed, there are naturally fewer potential path, obstacles, and other data objections in each zone as compared to the entire routing area. Dividing a routing area into zones—as taught by Vaughn in paragraph 157—does not, however, teach, suggest, or otherwise render obvious at least "locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles" recited in claim 2.

Vaughn's paragraph 182 describes actual routing of traces performed by Vaughn's routing engine 118 of Figure 3A. Paragraph 182 specifically describes the example shown in Vaughn's Figure 14E in which trace G-G' is routed around traces E-E' and B-B'. As can be seen in Figure 14E and as should be apparent from the description in paragraph 182, Vaughn does not route trace G-G' by first "locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles." In fact, nowhere does Vaughn show nodes between obstacles that represent the maximum number of traces that could pass between the obstacles. Rather, as can be seen in Figure 14E, Vaughn simply places each segment 578, 580, 582, 584, 586, 588, 590, 592, and 594 of trace G-G' to avoid crossing trace E-E' and trace B-B'.

Vaughn thus fails to teach, suggest, or otherwise render obvious at least the following recitation in claim 2: "locating a particular number of nodes between a pair of said obstacles, said particular number corresponding to a maximum number of traces that can pass between said obstacles." For at least this reason, independent claim 2 is patentable over Vaughn.

Claims 3, 6-11, 44, 55, and 56 depend from claim 2 and, at least for this reason, are also patentable over Vaughn. Moreover, claims 3, 6-11, 44, 55, and 56 recite additional features not taught or rendered obvious by Vaughn. For example, claim 6 recites that "said means for adjusting locates said particular number of nodes along a line segment between said pair of obstacles." Vaughn does not teach, suggest, or otherwise render obvious such a feature. For

example, in none of the portions discussed above with respect to claim 2 does Vaughn even teach creating a line segment between a pair of obstacles much less locating along such a line segment nodes representing possible paths for traces between the obstacles. As another example, claim 7 recites that the line segment of claim 6 "is a shortest line segment between said pair of obstacles." As discussed above, Vaughn does not even teach creating a line segment between a pair of obstacles and locating nodes represent possible paths for traces between the obstacles much less that such a line segment is the shortest line segment between the pair of obstacles.

Turning now to independent claim 12, Applicants initially note that, in rejecting claim 12, the PTO relies on two different functions (the routing of a trace referred to in Figure 14G and the minimum spanning tree analysis illustrated in Figure 5) of Vaughn that do not interact. Specifically, the PTO equates the start node, interim node, and target node shown in Figure 14G of Vaughn (which are associated with the function performed by Vaughn's routing engine (118 of Figure 3) of routing traces) with the source node, intermediate nodes, and destination node of claim 12. The PTO then equates the minimum spanning tree analysis shown in Figure 5 of Vaughn and performed by Vaughn's analysis engine with the "means for iteratively creating a plurality of partial paths" in claim 12. Vaughn does not, however, perform the minimum spanning tree analysis on the start node, interim node, and target node shown in Figure 14G. In fact, the minimum spanning tree analysis shown in Figure 5 of Vaughn is performed by Vaughn's analysis engine (110 in Figure 3A) long before Vaughn's routing engine performs the routing referred to in Figure 14G. Clearly, as Vaughn's routing engine (118 in Figure 3A) is routing traces from the start node through an interim node to a target node referred to in Figure 14G, the routing engine never performs the minimum spanning tree analysis. For at least this reason, the routing of a trace performed by Vaughn's routing engine (118 in Figure 3A) referred to in Figure 14G does not meet the following recitations in claim 12: "means for determining a routing cost of each said partial path," and "means for discarding all of said partial paths that extend to one intermediate node except the partial path with the lowest routing cost if more than one partial path extends to said one intermediate node."

Vaughn's minimum spanning tree analysis, as mentioned, is performed by Vaughn's analysis engine (110 of Figure 3A) on nodes 230, 232, 234 of Figure 5. None of nodes 230, 232, 234 can be a source node or a destination node because the minimum spanning tree analysis does not attempt to find a shortest connection from any particular node to any other particular node.

Rather, the minimum spanning tree analysis merely finds the shortest set of line segments that connect all of the nodes without regard to any one node being a start node or an end node. For example, as shown in Figure 5, line segments A1 and A2 connect nodes 232 and 234 with node 230 as an intermediate node. Line segments B1 and B2 connect nodes 230 and 232 with node 234 as an intermediate node, and line segments C1 and C2 connect nodes 230 and 234 with node 232 as an intermediate node. Because the minimum spanning tree analysis illustrated in Figure 5 does not treat a specific node as a source node, the minimum spanning tree analysis cannot meet the recitation in claim 12 of "iteratively creating a plurality of partial paths, each said partial path extending ***from said source node*** to an intermediate node in said array." In other words, because each set of line segments A1/A2, B1/B2, and C1/C2 shown in Figure 5 start from a different one of nodes 230, 232, 234, those sets of line segments are not partial paths that extend "from said source node."

For at least the foregoing reasons, independent claim 12 is patentable over Vaughn.

Claims 13-17, 46, and 63 depend from claim 2 and, at least for this reason, are also patentable over Vaughn. Moreover, claims 13-17, 46, and 63 recite additional features not taught or rendered obvious by Vaughn. For example, new claim 63 recites that the "means for determining a routing cost determines said routing cost of each said partial path by summing a length of said partial path and a length of a straight line from said intermediate node to which said partial path extends to said destination node." (Support for this claim can be found at least in paragraph 87.) For at least this reason, claim 63 is further patentable over Vaughn.

Independent claim 18 recites "means for applying forces to ones of said nodes, wherein a magnitude of one of said forces applied to one of said nodes ***is proportional to a proximity of said one of said nodes to one of said obstacles***," and claim 18 further recites "means for moving within said proposed physical layout each of said ones of said nodes in accordance with said force applied to said one of said nodes." In rejecting former claim 19, which included recitations relating to applying forces to nodes, the PTO relied on paragraphs 170 and 182 of Vaughn and on Figure 13C and accompanying written descriptions of Figure 13C. Neither paragraph 170 nor paragraph 182 nor descriptions of Figure 13C, however, describe applying a force to a node that is proportional to a proximity of the node to an obstacle. Rather, paragraphs 170 and 182 and the description of Figure 13C merely describe routing a trace around an obstacle. Those portions of Vaughn mention routing the trace around an obstacle and ripping up a trace when necessary, but

there is no mention of applying forces to nodes that are proportional to a node's proximity to the obstacle and then moving the nodes in accordance with the forces. For at least this reason, independent claim 18 is patentable over Vaughn.

Claims 21, 48, 57, and 58 depend from claim 2 and, at least for this reason, are also patentable over Vaughn. Moreover, claims 21, 48, 57, and 58 recite additional features not taught or rendered obvious by Vaughn.

Conclusion:

In view of the foregoing, Applicant submits that all of the claims are allowable and the application is in condition for allowance. If at any time the Examiner believes that a discussion with Applicant's attorney would be helpful, the Examiner is invited to contact the undersigned at (801) 426-2106.

Respectfully submitted,

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